Claims

What is claimed is:

1. A method for evaluating a multiplicity of data handling devices each having a sealed chamber with several interior surfaces, the method comprising steps of:
   (a) selecting at least one of the multiplicity of data handling devices, the selected device(s) having a cavity and a sealed housing portion adjacent thereto;
   (b) providing an impurity chamber at a first pressure and containing thousands of dispersed gas-borne particles that each contain a marker impurity that is substantially absent from all of the interior surfaces of the selected device(s);
   (c) exposing the sealed portion of the selected data handling device(s) to the impurity chamber while maintaining a pressure of the cavity at a second pressure lower than the first pressure; and
   (d) evaluating the multiplicity of data handling devices based on an indication of whether the marker impurity was present in the selected device(s) in an amount exceeding a predetermined threshold.

2. The method of claim 1 in which the selecting step (a) comprises steps of:
   (a1) leak-testing at least some of the multiplicity of data handling devices; and
   (a2) finalizing the selection step (a) by selecting the at least one device based on an outcome of the leak-testing step (a1).

3. The method of claim 2 in which the finalizing step (a2) comprises steps of:
   (a2A) identifying a range of marginal leak rates broadly enough so as to include at least one leak rate corresponding to one of the multiplicity of data handling devices; and
   (a2B) identifying a subset of the data handling devices such that each identified device has a leak rate within the identified range, the identified device(s) being the selected device(s).

4. The method of claim 1 in which the providing step (b) includes steps of:

(b1) providing a mixture comprising the marker impurity and a carrier impurity;

(b2) agitating the mixture to disperse the marker impurity into a gas.

5. The method of claim 4 in which the marker impurity is diamond dust and in which the providing step (b1) includes a step of mixing a mass M of diamond dust with a larger mass > 9M of talc.

6. The method of claim 4 in which the multiplicity of data handling devices can each store data in thousands of tracks written therein, the tracks having a median width W, a subset of the thousands of particles each having a length greater than W, at least 5% of the particles in the subset having a length less than 10W so as to reduce an amount of the marker impurity needed to perform the evaluating step (d) effectively.

7. The method of claim 1 in which the multiplicity of data handling devices can each store data in thousands of tracks written therein, the tracks having a median width W, a subset of the thousands of particles each having a length greater than W, at least 5% of the particles in the subset having a length less than 10W so as to reduce an amount of the marker impurity needed to perform the evaluating step (d) effectively.

8. The method of claim 7 in which the evaluating step (d) is performed by generating an indication of how well the selected device(s) performed after the exposing step (c) began.

9. The method of claim 1 in which the providing step (b) includes a step (b1) of pressurizing the impurity chamber so that the first pressure is at least 5 psi higher than the second pressure.

10. The method of claim 1 in which the evaluating step (d) comprises steps of:

(d1) selecting a lower leak threshold rate if the impurity indication is positive, and otherwise selecting a higher leak threshold rate (i.e. higher than the "lower" leak threshold rate); and

(d2) performing a leak test on some of the multiplicity of data handling devices using the leak threshold rate selected in the step (d1).

11. The method of claim 1 in which the sealed housing portion includes a porous filter and in which the exposing step (c) includes steps of:

(c1) positioning the porous filter between the impurity chamber and the cavity; and

(c2) permitting a gas to flow from the impurity chamber through the porous filter into the cavity.

12. The method of claim 11 in which the step (c2) is sustained for a period of at least one day.

13. The method of claim 1 in which the cavity is a localized portion of a device housing interior bounded by the interior surfaces, and in which the exposing step (c) includes a step (c1) of operating the selected data handling device(s) so that the localized portion is partially evacuated.

14. The method of claim 1 in which the evaluating step (d) includes a step (d1) of failing the multiplicity of data handling devices if the amount of the impurity is estimated to exceed the predetermined threshold and otherwise passing the multiplicity of data handling devices, the predetermined threshold being effectively zero.

15. The method of claim 14 in which the marker impurity provided in the providing step (b) is at least 10% harder than a data storage media surface inside the sealed chamber, and in which the exposing step (c) results in a portion of the marker impurity being deposited into the data storage media surface.

16. The method of claim 1 in which the marker impurity provided in the providing step (b) is at least 10% harder than a data storage media surface inside the sealed chamber, and in which the exposing step (c) results in a portion of the marker impurity being deposited into the data storage media surface.

17. The method of claim 1 in which the marker impurity provided in the providing step (b) is at least 10% softer than a data storage media surface inside the sealed chamber, and in which the exposing step (c) results in a portion of the marker impurity being deposited onto the data storage media surface.

18. The method of claim 17 in which the evaluating step (d) includes a step (d1) of optically examining the media defect to verify that the defect contains some of the marker impurity.

19. The method of claim 18 in which the marker impurity includes a luminescent material, and in which the examining step (d1) includes a step of maintaining a region adjacent the media surface at a lighting level of less than 3 hectolux to detect whether the luminescent material is present.

20. The method of claim 18 in which the marker impurity includes a dye, and in which the examining step (d1) is performed by viewing the media surface to detect whether the dye is present.

21. The method of claim 1 in which the marker impurity provided in the providing step (b) is selected so as to be harder than a data storage surface of the tested device so that one of the airborne particles can damage and become lodged into the data storage surface.

22. The method of claim 1 in which the evaluating step (d) includes a step (d1) of analyzing the chemical content of a media defect with a spectrum analyzer to verify that the defect contains some of the marker impurity.

23. The method of claim 1 in which the evaluating step (d) is performed by generating an indication of how well the selected device(s) performed after the exposing step (c) began.

24. The method of claim 23 in which the evaluating step (d) includes a step (d1) of monitoring an average bit error rate (BER) during the exposing step (c) to determine whether a significant BER change occurs.

25. The method of claim 24 in which the evaluating step (d) further includes steps of:

(d2) for a given one of the selected device(s), determining whether the BER over a predetermined interval grows by at least 3%, the predetermined interval being at least 10 seconds;

(d3) repeating the determining step (d2) for at least one more of the selected device(s); and

(d4) generating a less favorable evaluation if the steps (d2) and (d3) each result in a measured BER increase, and otherwise generally generating a more favorable evaluation (i.e. more than the "less favorable" evaluation).

26. A method for evaluating a multiplicity of data handling devices each having a sealed chamber with several interior surfaces, the method comprising steps of:

(a) providing an impurity chamber containing thousands of dispersed gas-borne particles that each contain a marker impurity that is substantially absent from all of the interior surfaces of a tested one of the multiplicity of devices; and

(b) a step for evaluating the multiplicity of data handling devices using the marker impurity.

27. The method of claim 26 in which the providing step (a) includes steps of:

(b1) providing a mixture comprising the marker impurity and a carrier impurity;

(b2) agitating the mixture to disperse the marker impurity into a gas.

28. The method of claim 26 in which the step for evaluating includes steps of:

(b1) operating the tested device so that a localized portion of the chamber thereof is partially evacuated, the localized portion being adjacent to an imperfectly sealed wall of the tested device; and

(b2) exposing the imperfectly sealed wall of the tested device to the impurity chamber.

29. The method of claim 26 in which the marker impurity provided in the step (a) is selected so as to be harder than a data storage surface of the tested device so that one of the airborne particles can damage and become lodged into the data storage surface.

30. The method of claim 26 in which the step for evaluating (b) is performed by generating an indication of how well the tested device performs after exposing the tested device to the impurity chamber.